NCERQA STAR GRANT ABSTRACT

EPA Grant Number: R827444010
Title: Study of Exposure and Body Burden of Children of Different Ages to Pesticides in the Environment
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Institution: Research Triangle Institute
EPA Project Officer: Chris Saint
Project Period: 9/1/99 - 8/31/02
Project Amount: $819.063
Research Category: Children's Vulnerability to Toxics

Objectives/Hypothesis: Recent studies have shown that there can be differences in the exposures to environmental pollutants experienced by children and adults in similar environments. These differences are derived from a number of factors including activities, diet, routes of exposure, and differences in the way children metabolize and excrete pollutants. This proposed study will examine both exposure to various pesticides and the resulting doses experienced by children of different ages and adults sampled from both rural and urban homes. **The main objective of the proposed program is to test the hypothesis that children have significantly higher environmental exposures and resulting doses than do adults living in the same home.** The study design will be able to test if the distribution of exposures for children living in urban environments is different from children living in rural environments.

The specific objectives of this project are to: compare exposure and dose levels between young children and adults in the same household; compare exposure and dose levels among young children of different ages; compare exposure and dose levels among young children in urban and rural households; estimate the associations between exposure level and internal dose as well as age-specific differences in the associations; identify age-specific childhood behavior patterns that increase or decrease a child's dose for a given ambient exposure level; quantify exposure and dose variability within age groups of young children, and identify biological and physiological determinants of this variability.

Approach: Our proposed study, which builds on our earlier successful work in Minnesota (NHEXAS), will obtain exposure and dose measurements for comparing the exposures of children and adults to chlorpyrifos, diazinon, atrazine, and malathion sampled from both rural and urban homes. To maximize our study's cost-effectiveness, our study population comprises families identified for the pesticide module for the National Human Exposure Assessment Study (NHEXAS) conducted by RTI who are living in the

Minneapolis/St. Paul area and Goodhue/Rice counties. The study design will be able to test if the distribution of exposures for children living in urban environments is different from children living in rural environments. Samples of indoor air, personal (breathing zone) air, water, diet, surface wipe, surface press, house dust, dermal rinse, and pajamas ("body suits") will be collected to define potential exposure. Through the collection of urine samples and analysis for the target pesticides and their metabolites, e.g., chlorpyrifos and its metabolite trichloropyridinol and atrazine and its metabolite atrazine mercapturate, information will be gained about the dose experienced by individuals of different ages resulting from the measured exposure as will potential differences in metabolism as reflected by differing ratios of parent compound to metabolite in the different age groups. A method for collecting urine samples from children in diapers will be developed and tested as will immunoassay-based screening tests to target homes to provide the highest probability of collecting expensive samples that will provide useful information. A subset of individuals will be sampled for volatile organic compounds in both personal air and exhaled breath. The activities of selected children will be videotaped and analyzed to link behaviors to measured chemical data.

The exposure information will be developed into a model that links environmental chemical concentrations to age (as reflected by activity, dietary, and metabolic differences) to permit an effective estimation of dose to the target analytes.

Expected Results: Exposure monitoring information from this research will provide a database of pathway and media exposures related to children by age for a target list of pesticides, including three OP insecticides (chlorpyrifos, diazinon, and malathion) and one triazine herbicide (atrazine). Testing of the hypotheses will provide us with an understanding of the relative importance of urban versus rural exposures (for the test compounds) and whether children receive higher doses from common exposures within a family, and the relative importance of pathways and physiological/metabolic factors which contribute to these higher doses. Developed models will improve the accuracy of dose prediction. **Improvements in Risk Assessment or Risk Management:** As a result of this research, a clearer understanding of the exposures and doses experienced by children of different ages will be obtained and can be used to better understand the risk of an adverse health effect resulting from a potentially age-dependent dose of pollutants.

Supplemental Keywords: multi-media exposure analysis, toxic substances, metabolism.